The benefits of investing in others: volunteering and longevity based on analysis of obituary data

Honors Research Thesis

Presented in Partial Fulfillment of the Requirements for graduation
"with Honors Research Distinction in Psychology" in the undergraduate
colleges of The Ohio State University

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4/14/14
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Abstract

Previous research suggests giving social support may be a critical component to the health benefits of social relationships (Brown, Nesse, Vinokur, & Smith, 2003). The current study aimed to investigate how giving support to others through participation in service activities relates to longevity, especially when considered with other previously significant social integration factors such as marriage and religious involvement. This study utilized two sets of obituaries coded for activity type as a novel data source. Study 1 consisted of 25 to 30 randomly selected obituaries from each of 50 major cities (n = 1310) coded for volunteer activities, religious involvement, and demographic information such as gender and education. Volunteering, religious involvement, and being female were all associated with longevity. Mention of a volunteer activity remained significant when controlling for the other variables. To explore the role of social integration in these effects, study 2 utilized obituaries (n = 805) from a two-month period in Des Moines, Iowa, which were coded for volunteerism, identical demographic factors, as well as additional social integration measures (marital status and membership in a social group organization). Results of the prior study were replicated. However, inclusion of other social integration variables reduced this effect to non-significance. These findings indicate that the effects of volunteerism on longevity are likely the result of increased social integration instead of separate effects of altruistic goals. Our study suggests using a novel methodological approach that social integration is a crucial variable for health.

Introduction

In today's society, many Americans know that health behaviors such as nutritious eating and not smoking are keys to longevity. While there is much to be said for these factors, there is another behavioral factor that is often left out of the conversation. Social integration, or a person's number of social relationships and frequency of interaction with these people, has been shown to be a significant factor predicting age at death, more so than many physical factors (Holt-Lunstad, Smith, & Layton, 2010). While social integration in general has been widely studied in relation to health, specific types of social interactions have been the subject of less research. In light of recent research suggesting that giving social support might be beneficial to health, we sought to examine the role of serving others in relation to mortality. In this study, we seek to use obituaries as a new data source to look at volunteer activity and age at death.

Social Integration and Longevity

Social relationships are inherent in any volunteer activity, and therefore it is important to review the impact and possible mechanisms of social integration on health prior to looking at volunteerism specifically. Social connection and involvement have been previously shown to be particularly important factors in longevity (House, Landis, & Umberson, 1988; Holt-Lunstad, Smith, & Layton, 2010). Research on social relationships and health began as a result of studies retrospectively linking social isolation with mental and physical ailments (House, Landis, & Umberson, 1988). The emergence of the concept of social support from these studies served as a catalyst for a surge in research on the subject in the 1970's, leading to a multitude of longitudinal and quasi-experimental studies positively linking social integration and health. The effects of social networks on length of

life were much stronger than originally hypothesized. When social networks across four domains of marital status, religious involvement, contact with family or friends, and participation in organizations were examined in adults in a nine year study, it was found that isolation from social ties made an individual two times more likely to die in the timeframe (Berkman and Syme, 1979). It was determined that this effect of isolation was equally true for all causes of death including heart disease, cancer, and stroke (Berkman and Syme, 1979).

Social networks are on par with other risk factors in ability to predict mortality. A meta-analytic review of 148 studies found that social relationships were a stronger predictor of mortality than alcohol consumption, level of physical activity, and body mass index (Holt-Lunstad, Smith, & Layton, 2010). These findings demonstrate that it is important to think of social relationships as just as strong predictors of mortality as the physical risk factors that are often studied in the context of longevity. These findings add to the robust body of work on social networks and highlight social integration as an important predictor of mortality in health research. It is also of note that within the meta-analytic review, studies that incorporated multiple measures of social connection tended to better predict mortality, indicating the complicated mechanism of action of social networks and the need for further study on what is driving these effects.

Mechanisms of Action of Social Support

The two widely accepted models of the effect of social support on health are the stress buffering and main effect models (Cohen, 2004). The stress buffering model asserts that when one is under stress, one's social network provides a source of support that can relieve the stress, thereby lessening the potential ill effects of the stressful event. For

example, a friend or family member may provide financial support to someone who has lost a job (Cohen 2004). Thus, received social support may be the critical determinant of the health effects. It may not even be necessary to actually receive the support, as it has been demonstrated that it is more important that the stressed individual *feels* that they have a friend to count on, regardless of whether this support was initiated (Cohen, Mermelstein, Kamarck, & Hoberman, 1985).

The other model for explaining the relationship between social relationships and health is the main effects model. The main effect model does not necessarily require that someone be under stress to obtain health benefits from social relationships (Cohen, 2004). This model instead focuses on social integration, asserting that by having meaningful social relationships and activity, individuals may either benefit from a higher sense of purpose and belonging or may acquire healthy lifestyles as a result of desire to fill the role of member of a group (Cohen, 1988). It is possible that these models can work together, with the benefits of the main effect model being bolstered in times of crisis with additional, direct support at the center of the stress buffering model.

However, in neither model have the effects of providing social support been given much attention. More recent work suggests an alternate model: that the act of *giving* support in relationships plays as large or larger role in mediating health benefits than receiving social support (Brown, Nesse, Vinokur, & Smith, 2003). Individuals actively giving support had a significantly lower odds ratio for mortality even when receiving support was controlled (Brown et al., 2009). This effect was seen for giving of direct instrumental support and emotional support (Brown, Nesse, Vinokur, & Smith, 2003). Work on interpersonal goals in social relationships offers evidence that giving support to others has

the potential to confer health benefits independent of an increase in reciprocal received support (Canevello & Crocker, 2011). It was found that people with compassionate goals, focused on supporting others' well-being, were both more likely to give support over those with self-image goals and were also more likely to see a decrease in distress (Canevello & Crocker, 2011). It is important that this decrease in distress need not be tied to received support, only the act of giving social support. While previous social support literature has largely focused on benefits conferred through received support, these findings suggest the act of giving to others should be taken seriously in social and health research.

The central focus of this thesis is to explore further the relationship between social integration and activities supportive of others on health. In particular, obituaries will be used as a source of data and longevity will be used as the measure of health.

Obituaries as a Source of Data

Many of the studies examining social relationships and mortality rely on longitudinal data obtained through surveys. Information on lifestyle and longevity has been gathered in a handful of other ways, though, such as through analysis of smile intensity in photographs and of social words in autobiographies (Abel & Kruger, 2010; Pressman & Cohen, 2007). In the former, smile intensity was correlated with positive emotions, and was found to predict mortality. In another non-longitudinal design, social desirability bias was avoided by examining the autobiographies of deceased psychologists for social word usage (Pressman & Cohen, 2007). Obituaries similarly avoid social desirability by providing lifestyle information through means outside of self-report. Obituaries have previously been used to examine sport fan identity, gender and ethnicity, and social status (End, Meinert, Worthman, & Mauntel, 2009; Egrin, 2009; Fowler & Bielsa, 2007). Obituaries

provide a rich source of data from which mortality, community involvement, and social relationship information can be extracted. Thus far to the best of our knowledge, obituaries have not been used to study longevity and social relationships or activities.

While obituaries are obviously not first-person accounts of one's involvement and relationships, they can serve as condensed representations of the most important aspects of one's life. If certain activities were highly important to an individual, it is likely that they would be well known by that individual's family and friends and would be mentioned in the obituary. By using writings by a close social relation, we hope to be able to get an accurate depiction of an individual's social network and involvement in a way that will be different than what a self-report survey could provide.

There are already several well-studied factors that influence longevity that can be gleaned from obituaries and used to validate the data. Women have a life expectancy of 80.5 years, compared to 75.5 years for men (U.S. census, 2008). It has also been shown that those who are affiliated with a religion and attend public services regularly live significantly longer (Hummer, Rogers, Nam, & Ellison, 1999; Hummer, Ellison, Rogers, Moulton, & Romero, 2004). Regular religious attendance is associated with a higher proportion of marriage, which has also been shown to have strong association with age at death (Hu and Goldman, 1990). Ability to replicate these well-studied factors using obituary data will serve to validate our research. Furthermore, our analysis will be able to control for these factors to better assess the unique contribution of volunteer activity on mortality risk. By examining obituaries for data related to volunteer involvement and mortality risk, we seek to add to the literature using a novel data source.

Volunteer Activity and Longevity

Support of the hypothesis that giving to others might be beneficial to one's own health has come from studies looking at the effects of volunteerism on health. It has been shown that volunteering for at least 100 hours annually leads to increased health and survival, even in the presence of pre-existing health conditions (Luoh and Herzog, 2002). The same reduced risk of mortality with volunteer activity was found by Ayalon (2008), although number of volunteer hours did not have an effect, contrary to previous studies. A recent meta-analysis of the volunteer literature found that volunteering in an organization reduced mortality risk by an average of 25% after physical and other social factors were controlled (Okun, Yeung, & Brown, 2013).

These findings are promising, but measures of social inclusion have been shown to greatly reduce the effect of volunteerism on health. In other words, controlling for variables such as marital status, religious service attendance, and social leisure activities reduces the effect of volunteerism on health (Harris & Thoreson, 2005). Thus, it is not clear whether the effects of volunteerism on health are due to the motivation to help others and give support or a reflection of the social interactions that result from volunteering regularly.

Indeed, volunteering has been linked to increased social integration as well as more social connections (Harris & Thoreson, 2005). As stated previously, it has been shown that social integration has been associated with longevity, and therefore it is natural to infer that elderly volunteers experience an increase in health as a result of these widened social circles. In addition, it has been found that elderly volunteers who also attend religious services and socialize frequently benefit more from volunteering in terms of health than those that are not as socially active (Harris & Thoreson, 2005; Oman et. al., 1999). It has been postulated that the reason for this added benefit may lie in the fact that these elderly

adults will have specific age-appropriate goals and desires to stay involved, and these aid in their enjoyment and benefit of volunteering (Harris & Thoreson, 2005). This social connections theory rests on the idea that volunteering provides one with a certain level of social support within the act of volunteering. However, this evidence does not necessarily discredit the support-giving model, it simply reinforces the reality that social benefits likely come from varied sources.

Investigation of volunteer's motives for serving indicated that pro-social goals may underlie volunteering's effects on health. It was found that those who volunteered for self-oriented reasons did not gain health benefits of volunteering and had a mortality risk close to those who did no volunteer work (Konrath, Fuhrel-Forbis, Lou, & Brown, 2012). Additionally, it has been shown that those who volunteer individually had a larger decrease in mortality risk than those who volunteered as part of a social organization (Ayalon, 2008). This may suggest that those who volunteered individually had motivations other than to fill a social role or gain closer relationships to those within a group. These studies suggest that the health benefits derived from volunteering may not simply be the result of support from friends or family in times of need, but due to actively giving support as well.

In the present study, we seek to continue to examine the relationship between organized social activities, volunteering in both individual and group settings, and length of life using novel data obtained from obituaries. Pro-social goals will be operationalized by the mention of membership in a service organization in the obituary. If volunteerism provides benefits through means of giving support, it is expected that participation in activities that are prosocial (service-based) in nature, will be associated with a lowering of mortality risk over and above that which is seen through other social activities. We

hypothesize that volunteer activity in both individual and group settings will be significantly correlated with longevity, however we expect these effects to be diminished in some way when other social support and demographic variables (i.e. religious involvement, marital status, and gender) are added.

In this thesis, analyses from two studies are reported. In the first study, 25 to 30 randomly selected obituaries from each of 50 major cities were used. In Study 2, a more restricted geographic analysis was done to more closely focus in on the question of being a member of a service related organization relative to a general social organization.

Methods-Study 1[1]

Researchers randomly selected obituaries (*n* range: 23 - 30) from the newspaper websites of 50 of the 51 cities that are home to a NFL, NBA, MLB, or NHL team (Oakland obituaries were inaccessible). Initially, a total of 3,084 obituaries were sampled, with 1,609 excluded from the analysis because they were basic "death announcements" that included only minimal information about the deceased individual. An additional 165 were excluded from analysis due to missing age at death. A total of 1,310 obituaries (734 males, 576 females) were included in the study, as they provided a more elaborate description of the deceased individual and his/her life. Access to obituaries varied across websites. For 45 of the 50 cities, the sampled obituaries appeared in the newspapers from August 2010 to August 2011. Some online newspapers limited access to obituaries so for Raleigh and Phoenix, obituaries were selected from those that were published from January 1, 2011 through August 2011, while Vancouver, Memphis, and Cincinnati only provided access to obituaries that had been posted in the previous month.

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[1] Materials for Study 1 generously provided by End, Maley, & Wallace, *Xavier University*.

Researchers coded for references to identification with sport, as well as other demographic variables, including mention of gender, age, occupation, level of education, nationality, religion, and non-sport related leisure activities. We accessed the data to further code the non-sport related leisure activities for mention of volunteer participation. Volunteer activity was coded as a bivariate variable, as number of activities were not recorded during the original study. Access to these obituaries provided an opportunity to do a preliminary analysis of questions posed in the present study.

Results Study 1

As an initial validation of the sensitivity of obituaries, the relationship between demographic variables and longevity was assessed. As would be expected, there was a significant relationship between gender and age at death ($t(1308)=4.33, p<.001$). Males ($M=75.02$; $SD = 15.63$) died younger than females ($M=78.92$, $SD=16.87$) by about four years.

For those obituaries in which a religious organization was mentioned, the individual died at an older age ($M=79.09$, $SD=14.85$) than the individual in obituaries that didn't mention a religious organization ($M=73.75$, $SD=17.46$). There was over a five year difference between these groups, which was statistically significant ($t(1303)=5.97$, $p < .0001$). There also was a significant gender difference in whether or not religion was mentioned in the obituary ($t(1364.61)=3.7$, $p < .001$) with women's ($M=.60$, $SD=.49$) obituaries more likely to mention religion than men's ($M=.51$, $SD=.50$). When controlling for gender in assessing the effects of religion on longevity, the effect of religion on longevity remained significant ($F(1,1302)=32.29$, $p <.001$).

Education was not mentioned in 806 of the 1475 obituaries. Among those obituaries that did mention education, those who only mentioned a high school education died

younger ((M=74.11, SD=18.32) than those whose highest level of mentioned education was college (M=75.29, SD=17.07), which was less than those in which an advanced degree was mentioned (M=76.82, SD=13.94). However, these differences were not significant (F(2,575)=.86, p = .43). When these analyses were run separately by gender there was a significant relationship for males (F(2,341)=7.32, p = .001), but not for females (F(2,231)=1.77, p = .173). This suggests that the well-documented effects of education on longevity can reliably be captured with obituaries for males. However, due to missing data for about half of the obituaries we did not use this variable in further analyses.

To address the primary question of interest, we compared the longevity of individuals who had a volunteer activity in their obituary (n=91) versus those who didn't (n=1219). Those who had a volunteer activity (M = 82.62, SD =11.33) lived over 6 years longer than those who didn't (M=76.3, SD=16.57), which was a statistically significant difference (t(120.62)=4.94, p < .001). To further assess this relationship, a linear regression was performed with gender, mention of a religious organization, and volunteer activity as predictor variables. The overall model was significant (F(3, 1301)=19.4, p<0.001; R^2=0.043). Volunteer activity significantly predicted unique variance in longevity beyond that accounted for by gender and religion (*B*=0.078, t(1301)=2.84, p<.01).

Table 1
Study 1-Linear regression of gender, religious activity, and volunteer activity with age at death.

	Unstandardized Coefficients		Standardized Coefficients		
	B	*SE*	*B*	*t*	*p*
(Constant)	72.31	0.74		97.28	0.000
Gender	3.31	0.90	0.10	3.70	0.000
Volunteer Activity	4.97	1.75	0.08	2.84	0.005
Religious Org. Member	4.67	0.90	0.14	5.19	0.000

Note: R^2=0.043 (p<.01)

Discussion Study 1

Obituaries performed consistent with prior epidemiological data, with women and religious individuals living significantly longer than men and the non-religious. Volunteers were also found to live significantly longer than peers that were not recorded as having volunteered. These findings demonstrate the utility of data obtained from obituaries and provide a basis for our second study. Study 1 did not code for participation in social groups, and thus leaves effects of social integration on the data unknown. An additional data set of obituaries was therefore employed to determine if the relationship between volunteerism and longevity accounts for variance over and above participation in other social, non-service groups.

Methods Study 2.

Selection of Data Source

The second study utilizes obituaries obtained from the Des Moines Register in Iowa. Ethnic diversity is strongly correlated with mortality risk and other health factors, and we took care to find a largely ethnically homogenous sample by geographically restricting our data. We chose Des Moines, Iowa due to its moderate size, nationally representative smoking rate, and largely non-Hispanic white population: 70.5% (U.S. Census Bureau, 2010; CDC, 2009).

Materials

The Des Moines Register online obituaries page has 20 to 60 new postings daily (http://www.legacy.com/obituaries/desmoinesregister/) and is freely accessible. All obituaries over a period of 60 days from January 1, 2012-February 29, 2012 formed the sample. All obituaries for individuals over the age of 25 were included. Participant ages

therefore ranged from 25-105 years with median age of 80. The Des Moines Register primarily serves ten communities: Altoona, Ankeny, Clive, Des Moines, Indianola, Johnston, Norwalk, Urbandale, Waukee, and West Des Moines.

New obituaries can be accessed daily for free by the public and all past years of obituaries are archived and available through a search function. Online obituaries are assessed a flat fee of $35 dollars for one day by the Des Moines Register, which differs from the print fee of $4.50 per line (Des Moines Register, 2013). The Register publishes all obituaries paid for by the family at the request of funeral homes. As a result, some choose not to submit obituaries or instead submit a death notice, which does not carry a charge. Death notices only include name and arrangements, and were therefore excluded from the present study. It can be assumed that obituaries do carry some financial or socioeconomic bias, favoring contributions from high SES members of the community and possibly providing a barrier to inclusion of low-income individuals.

Procedure

The obituaries were exported and coded for age, marital status, and activities. Age was taken directly from the obituary and recorded in years. Marital status at the time of death was recorded as either "married" or "not married". It was possible for an individual to both be marked as married and divorced, to denote a remarriage. If no marriage, life partner, or divorce was mentioned, the individual was recorded as "not married".

Activities were tallied and separated into categories based on activity type. A standardized protocol for categorizing each activity was developed and was used for all obituaries (See appendix A). In an attempt to reflect ongoing or recent involvement in activities, no childhood or college involvements were recorded. The principal variable of

interest, volunteer activity, was categorized as either individual activity unaffiliated with a group (e.g. tutoring, hospital volunteer), or as part of an organization with a service mission (e.g. Philanthropic Educational Organization (P.E.O.), Shriners). Both unaffiliated and group service activities were summed together for analysis in a variable labeled "volunteer activity", which served as the measure of volunteerism.

Mention of affiliation with a church or religious institution was noted as a dichotomous yes/no.

As for social participation, several categories were created. Participation in organizations with social, *non-service* purpose was tallied and coded as "organized socialization activity" (e.g. country clubs or masonic lodge). Other social interactions outside of formal organizations were coded under "informal family and friends activities." (e.g. fishing, travelling). Also included in this variable was socialization in an athletic context such as participating in team sports or golfing with friends.

Data Analysis

Normality was tested using a Kolmogorov-Smirnov test. Two-tailed simple bivariate Pearson correlations and hierarchical linear regression were run in SPSS. Mediational analyses were conducted using the PROCESS Macro.

Results Study 2

Of the 805 obituaries, 48% were men and 52% were women. Each of the primary variables was related to longevity. As expected, females lived significantly longer than males (Male, M=74.07, SD=15.129; Female, M=79.57, SD=14.15; t(188.67)=5.301, p<.001). Married individuals lived longer than individuals who were not married at the time of death (Married, M=79.14, SD=13.31; Not Married, M=71.09, SD=17.18 (t(331.31)=6.32,

p<.001). Individuals with a religious organization mentioned in their obituary lived longer than those who did not have a religious organization mentioned in their obituary (M=82.82, SD=12.66; No Church, M=74.89, SD=15.13 (t(415.21)=7.34, p<.001).

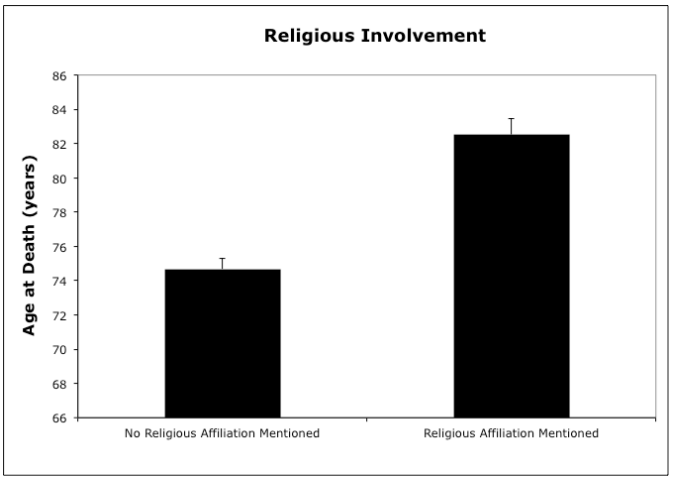

Figure 1. Relationship between religious involvement (mention of a religious organization in the obituary) and age at death.

Unlike in Study 1, the number of activities in each category were tallied. This led to skewed distributions. For example, the service activities variable was not normally distributed according to the Kolmogorov-Smirnov Test (D(805)=.43, p < .001). The majority of the obituaries (75%) did not list any service activities. 11.8% of the sample listed one activity and 6.1% listed two activities, while 7.5% listed 3 activities or more. There were several extreme outliers that listed six or even 8 service activities. To reduce the effect of these outliers on the analyses, a semi-continuous variable was created that grouped 3 or more activities together into one category. This was done for each activity variable.

There was a significant correlation between service activities and longevity (r (805) = .199, p< .001). There was a dose-response relationship between the number of organized social groups and longevity (r(805)=.2, p < .001) as well.

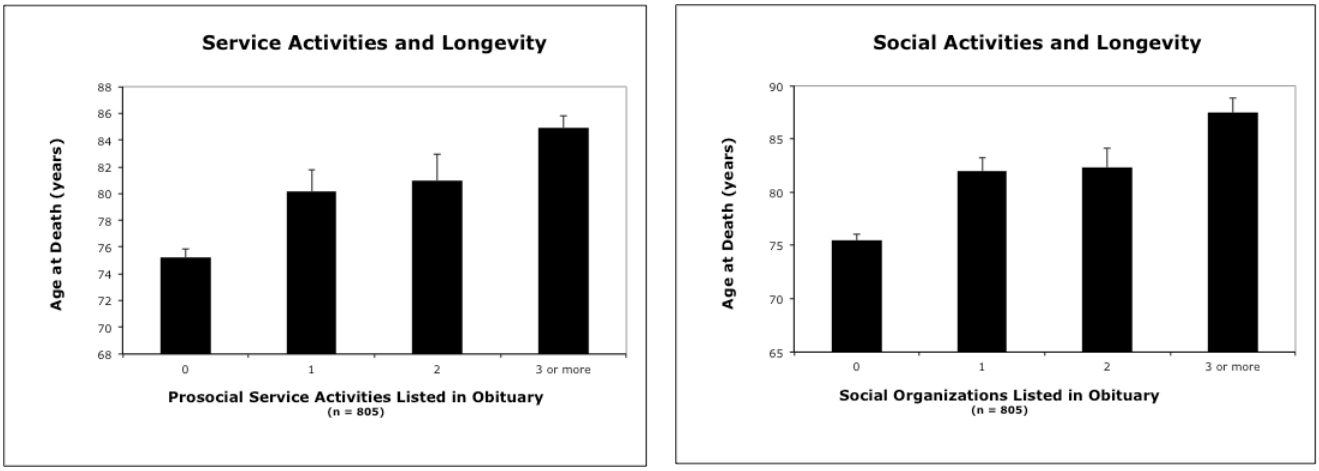

Figure 2. Relationship between age at death and service activities with a prosocial component (left) or involvement in a social organization (right).

Social activity with family and friends (e.g. playing games, travelling, sports clubs, golfing, etc.) was unrelated to longevity ($r(805)=-.031$, $p = .38$). It was also not related when scored as a dichotomous variable ($t(803)=-.27$, $p = .79$). Due to the lack of relationship between this measure of social activity and longevity, it was not analyzed further.

The correlation matrix of the aforementioned variables is shown in Table 2. This shows that mention of a religious organization was highly correlated with both organized, non-service social activity and service involvement [$r(805)=0.50$, $p<.001$; $r(805)=0.47$, $p<.001$]. Men were more likely to participate in organized, non-service social groups ($r(805)=-0.89$, $p<.001$). Neither gender was more likely to participate in service activities, although women were more likely to mention a religious organization ($r(805)=0.11$, $p<.001$). Marriage was also significantly correlated with participation in organized social, non-service activities, volunteer activities, and mention of a religious organization [$r(805)=0.18$, $p<.001$; $r(805)=.2$, $p<.001$; $r(805)=.25$, $p<.001$).

To replicate the analyses from Study 1, a linear regression was conducted with gender, participation in a religious organization, and service activities as independent

variables. The overall model was significant ($F(3, 801)=26.7$, $p < .001$; $r^2 = .09$). As hypothesized and demonstrated in Study 1, volunteer activity was a significant predictor of age at death, shown in Table 3.

To determine if the effect of service activities was independent of social activities, a hierarchal linear regression was run with the first step consisting of the measures previously shown to be predictive of longevity in Study 1. Marriage was added in the next step because of its well-known effect on longevity. In the final step, participation in an organized social group was entered. (The measure of social integration derived from time spent with family and friends was not entered because it was not significantly related to longevity). Table 4 summarizes these results. Service activity remained significant when marriage was added, but was reduced to non-significance in model 3 with the addition of other organized, non-service activities.

To determine if mention of social organizational activity mediated the relationship of volunteer activity on longevity, a meditational analysis was performed with gender, marriage, and mention of a religious organization in the model. Social organizational activity significantly mediated the relationship between volunteer activity and longevity, (Sobel $Z = 3.11$, $p = .002$).

Table 2
Study 2

Correlation matrix of main variables: age, gender, marital status, organized social group activities, volunteer activities, and religious activity.

	1	2	3	4	5	6
1. Age	___					
2. Gender	0.184**	___				
3. Marriage	0.242**	0.41	___			
4. Social Group, non-service	0.2**	(-)0.89*	0.178**	___		
5. Volunteer Activity	0.198**	0.033	0.204**	0.497**	___	
6. Religious Org. Member	0.198**	0.033	0.204**	0.351**	0.473**	___

*p<.05; **p<.01

Table 3
Study 2
Linear regression of gender, religious activity, and volunteer activity with age at death.

	Unstandardized Coefficients		Standardized Coefficients		
	B	*SE*	*B*	*t*	*p*
(Constant)	72.07	0.78		92.09	0.000
Gender	4.90	1.01	0.16	4.84	0.000
Volunteer Activity	2.03	0.62	0.12	3.25	0.001
Religious Org. Member	5.36	1.30	0.16	4.12	0.000

Note: R^2=0.091 (p<0.01)

Table 4

Study 2

Hierarchal regression of gender, religious activity, marriage, volunteer activity, and social activity with age at death.

	Unstandardized Coefficients		Standardized Coefficients		
Model 1	*B*	*SE*	*B*	*t*	*p*
(Constant)	72.07	0.78		92.09	0.000
Gender	4.90	1.01	0.16	4.84	0.000
Volunteer Activity	2.03	0.62	0.12	3.25	0.001
Religious Org. Member	5.36	1.30	0.16	4.12	0.000
Model 2					
(Constant)	68.19	1.05		64.68	0.000
Gender	4.80	1.00	0.16	4.83	0.000
Volunteer Activity	1.66	0.62	0.10	2.68	0.007
Religious Org. Member	4.16	1.30	0.12	3.20	0.001
Marriage	6.11	1.15	0.18	5.33	0.000
Model 3					
(Constant)	67.93	1.05		64.68	0.000
Gender	5.21	1.00	0.17	5.22	0.000
Volunteer Activity	0.84	0.66	0.05	1.27	0.204
Religious Org. Member	3.52	1.30	0.12	2.69	0.007
Marriage	5.85	1.14	0.18	5.12	0.000
Non-Service Soc. Org.	2.60	0.80	0.12	3.24	0.001

Note: R^2=0.091 for step 1 ($p<0.01$), R^2= 0.122 for step 2 ($p<0.01$); ΔR^2 = 0.031 for step 1 to 2, R^2=0.133 for step 3 ($p<0.01$); ΔR^2 =0.011

Discussion

The agreement of data across Study 1 and Study 2 indicate that obituaries can indeed be employed to further understand predictors of mortality and health. Previously well-documented relationships between longevity and marriage (Holt-Lunstad et al., 2010) and longevity and religious involvement (Chida, Steptoe, & Powell, 2009) were found in both Study 1 and 2. Additionally, volunteer activity significantly predicted age at death over and above the robust variables of gender, marriage, and religious involvement. Only involvement in other non-service, social organizations was found to reduce this effect.

Volunteerism was associated with longevity across two studies, indicating an important and unique relationship with health. We had hypothesized that this health effect

may be due to having more compassionate, prosocial goals. However, although volunteer activity was significant controlling for marriage and general social activities such as spending time with friends, participation in organized social groups explained common variance with the volunteerism category. This suggests that the motivation to participate in organized social groups is similar to the motivation to engage in prosocial, service activities. Thus, it appears that the health effect of participation in prosocial service activities is part of the general health benefits of social engagement in other organized groups. Volunteer and organized social activities have many of the same social components: regular, scheduled events with a usually consistent group of other people, and are therefore likely providing similar social opportunities for social support.

Although it is out of the scope of this study to assign causal factors for these findings, the data suggest what may be at the crux of the effects of activity on longevity is the importance of involvement in social groups united in some common purpose. Whether that purpose is religious, service, or community based does not seem to be of primary importance. Higher social integration may mean opportunities to fulfill roles of support-giver as well as support-receiver. The effects seen from volunteerism may have less to do with altruism and more to do with opportunity for increased social integration, as suggested previously by Harris and Thoreson (2005). Although we attempted to draw clear distinctions between activity type for coding purposes, we realize that the motivations for these activities varied for each person. The high correlations between church attendance and involvement in volunteer and community groups suggests that socialization begets more socialization, making it difficult to distinguish which relationships are specifically driving the effects. Additionally, the ability of non-service social organization involvement

to reduce volunteer activity's variance in the hierarchal regression suggests that volunteers may be performing service for socialization in addition to or in lieu of solely pro-social, helping goals. Our findings, in conjunction with previous work, affirm that factors of social integration should not be overlooked where longevity is concerned. Despite lack of clarity as to how social integration drives the effect, it is evident that involvement in volunteer activity is correlated significantly with increased age at death.

In terms of limitations, we do acknowledge that, due to the limited nature of obituaries, this study was unable to account for the cause of death or the health status of those included. This means that it may be that volunteers were on average healthier and therefore able and more willing to participate in additional activities. It is also likely that some causes of death were accidental and not influenced by lifestyle. Additionally, it is still not possible to definitively determine whether the social relationships act to confer benefits through giving or receiving support, and we do not claim to be able to make any causative statements through this study.

Aspects of mental health such as social integration and community involvements are often overlooked as contributors to wellness, and better understanding of their roles as predictors of mortality could lead to a more comprehensive approach to health and healthcare practices. In the future, it may be considered good practice to include measures of social integration along with other physical markers when considering one's health.

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Appendix

A. Protocol

All obituaries for the day are to be recorded, unless age is not mentioned. Exclude memorials and death notices as well as any obituary for an individual younger than 25. First copy and paste the obituary into word program with the date at beginning of day's section, then fill in excel sheet as completely as possible.

When copying and pasting into word, omit sentences detailing burial arrangements.

Gender: record male or female in gender column and put (0) for male or (1) for female in following column

Age: note age in years in Age (yrs) column. Age must be included. If not present in obituary, exclude data.

Marriage: denote 1 (yes) if mention current or deceased spouse.

If divorced add 1 (yes) to divorced column. If remarried, mark as 1 (yes) in marriage column in addition.

If no mention of spouse or significant other mark 1 (yes) in column denoting no mention of romantic relationship

Career: In first column record exactly the stated career. If more than one career is mentioned, use all that were held during adult life.

exclude jobs held as teens and record any work done pro bono in activities under prosocial/service

if other activities are listed that carry compensation, list them under career and not an activity category

ex: school board, jobs after retirement, public office

Veteran status: If veteran status is noted in obituary, put a (1) for yes. If not, put (0) for no. Record yes if wars served are mentioned or specific branch noted.

Total activities: numerical count of all activities listed. Should correspond to sum of all subcategories

Do not include any activities from high school or college careers, unless specifically indicated that they continued in adulthood

Do not add pets to activities unless in larger group or volunteer capacity

Do not count repeat activities twice, such as "working out" and "running" unless two distinct social groups are mentioned

Individual activities: defined as primarily solitary activities with no social or service connection.

Examples: gardening, reading, doing puzzles, making models, painting, music (not member of band), gambling, watching TV or movies, knitting, sewing, cars, pilot (hobby)

If any of these are mentioned as being done with a specific person or group, add to a social category

Organized socialization group activities: activities that involve socialization with others in formal setting, but not in an athletic, religious, or service-oriented setting.

Examples: Social clubs, country clubs, special-interest clubs (knitting, sewing, collectors, HAWKS flying club), Masonic Lodge-Acanthus Lodge, Order of the Eastern Star, American Military Society, Forty and Eight Voiture Nationale, Fleet Reserve Association, Naval Enlisted Reserve Assoc, Retired Enlisted Assoc, Veterans of Foreign Wars (VFW), Ntl Assoc of Retired Federal Employees, Knights Templar, National Sojourners, Ebony Club (group of Iowa sports fans), NEA , Medical Society Auxiliary, Questers, Wakonda Club, Daughters of the Nile

Organized group with service mission: activities that involve group membership in an organization that expresses community-oriented, service activity. Commitment to service as a group ideal is determined by research (primarily online) of mission statement or primary activities. This is in contrast to groups that meet solely for socialization or for a non-service goal, which should be included in the "organized group-socialization" category. May have other stated focuses outside of service.

Examples: Shriners, Za-Ga-Zig Shrine, PEO, Knights of Columbus, American Legion, Moose Lodge, Elks, American Veterans Assoc, Gideon's Intl, Neighborhood Associations, Altar and Rosary Society, Catholic Daughters of America, Public Hospital Auxiliary, United Methodist Women, Izaak Walton group, Church Women International

Note: If says "supported" or "worked with" instead of "member/a part of" add to prosocial instead of member of social-organized/service

Informal family friends activities: activities that involve socialization with others, but not in an organized or formal setting, nor with athletic, religious, or service-oriented goals.

Examples: fishing, travelling, sightseeing, spending time with family or friends (must explicitly say), cards, hunting, skydiving, playing board games, camping, BINGO playing

Unaffiliated/Individual Service activities: activities orientated towards helping others either directly or indirectly without outward expectation for reward and without receiving compensation.

Examples: volunteering in any way: homeless shelters, tutor, coach, pro bono work in field, fundraisers, "community volunteer," "civic volunteer", volunteer work associated with a church outside of specifically religious-oriented activities (youth leader, soup kitchen, but not pastor or lay minister), Cub Scout *Leader* , volunteer for historical society, helping at children's school, Meals on Wheels, American Cancer Society volunteer, board member of community group/volunteer group (nonpaid)

Athletic- social: participation in physical activity, defined as one that requires physical exertion, as part of a team or group

Examples: participation in sports teams, running club, skiing, Relay for Life or similar organizations, tennis, golf, bowling

Athletic- individual: participation in physical activity not involving others, and without inclusion in group dedicated to the activity

Examples: running or jogging, swimming, walking

There were only 14 individuals of the 805 who fell into this category, so was not analyzed further.

Church/religious: mention of church or religious affiliation or involvement. Will be dichotomous yes/no

Examples: minister, lay pastor, church member, Order of the Rosary

Leadership positions: Separate tally, not included in total activities. Categorize activity individual was a leader of and add to total activities, then also make a tally in the leadership category. Activity will only count once in total, but will be noted in a subcategory and the leadership category.

Finally, all activities should be recorded verbatim in individual columns.